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Virtual Network Management Information Model

draft-okita-ops-vnetmodel-00

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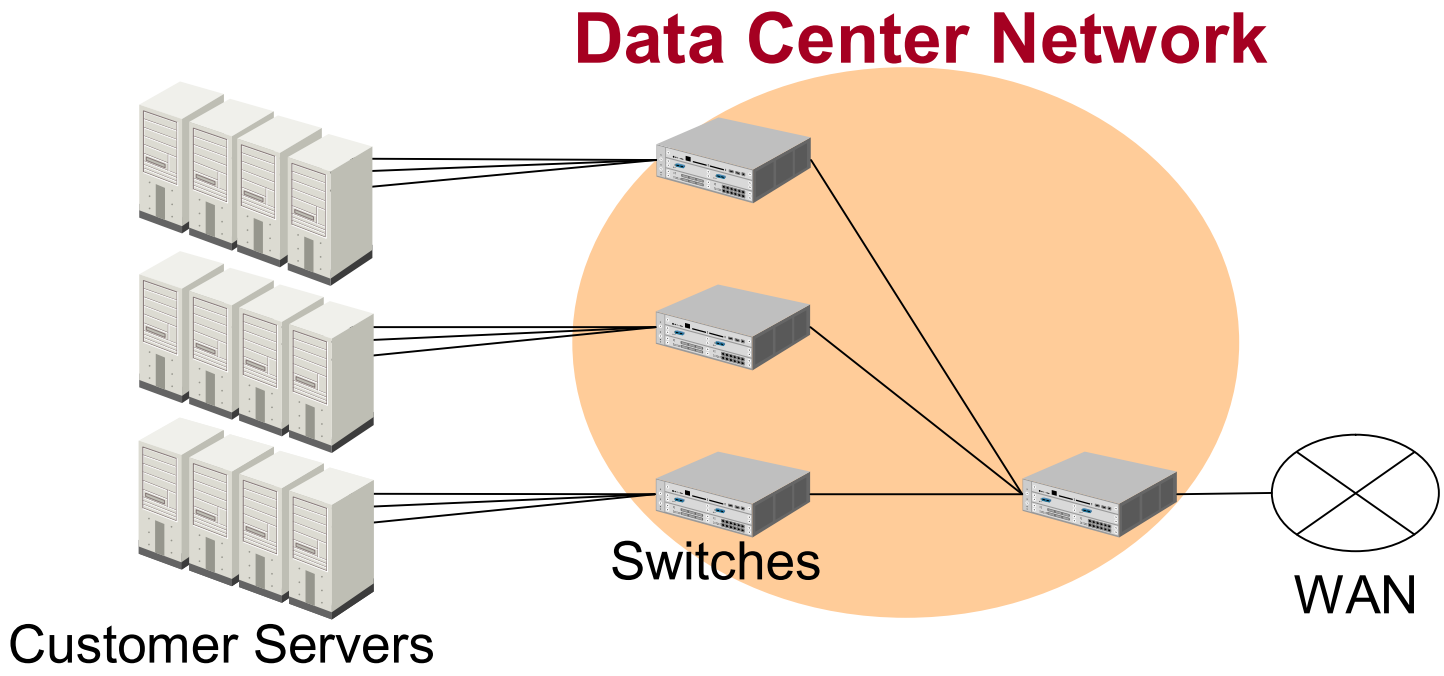
1-1 Background and Objective

- Background
  - Server virtualization in data centers.
  - Virtual switch as a part of a virtual network.
  - Increase of operation time for the virtual network.
- Objective
  - To provide a management information model for a virtual network of a data center.

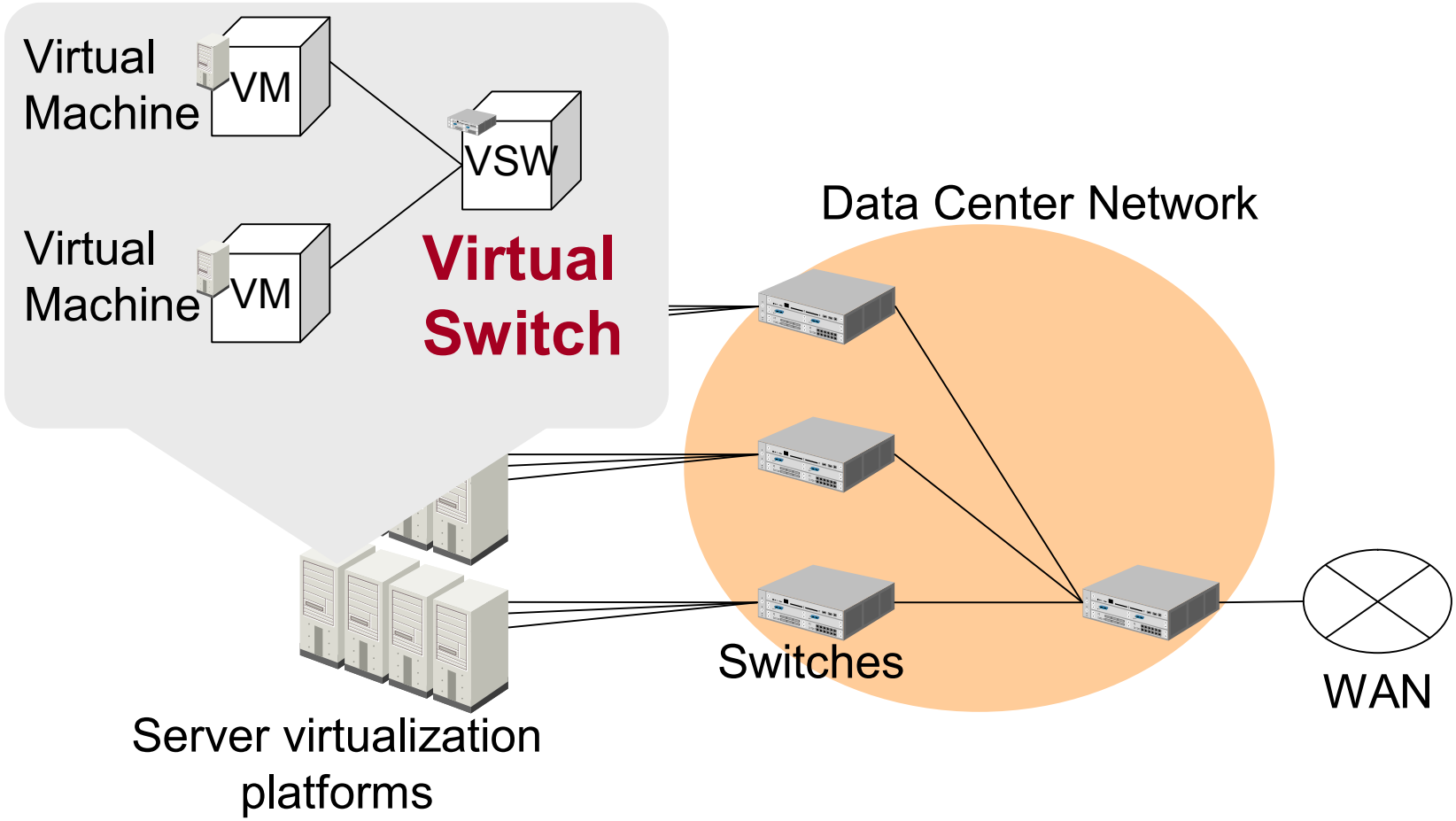
1-2 Background: Data Center Network

- A data center network connects between customer servers and WAN (Wide Area Network).
- We focus on the management of the data center network.



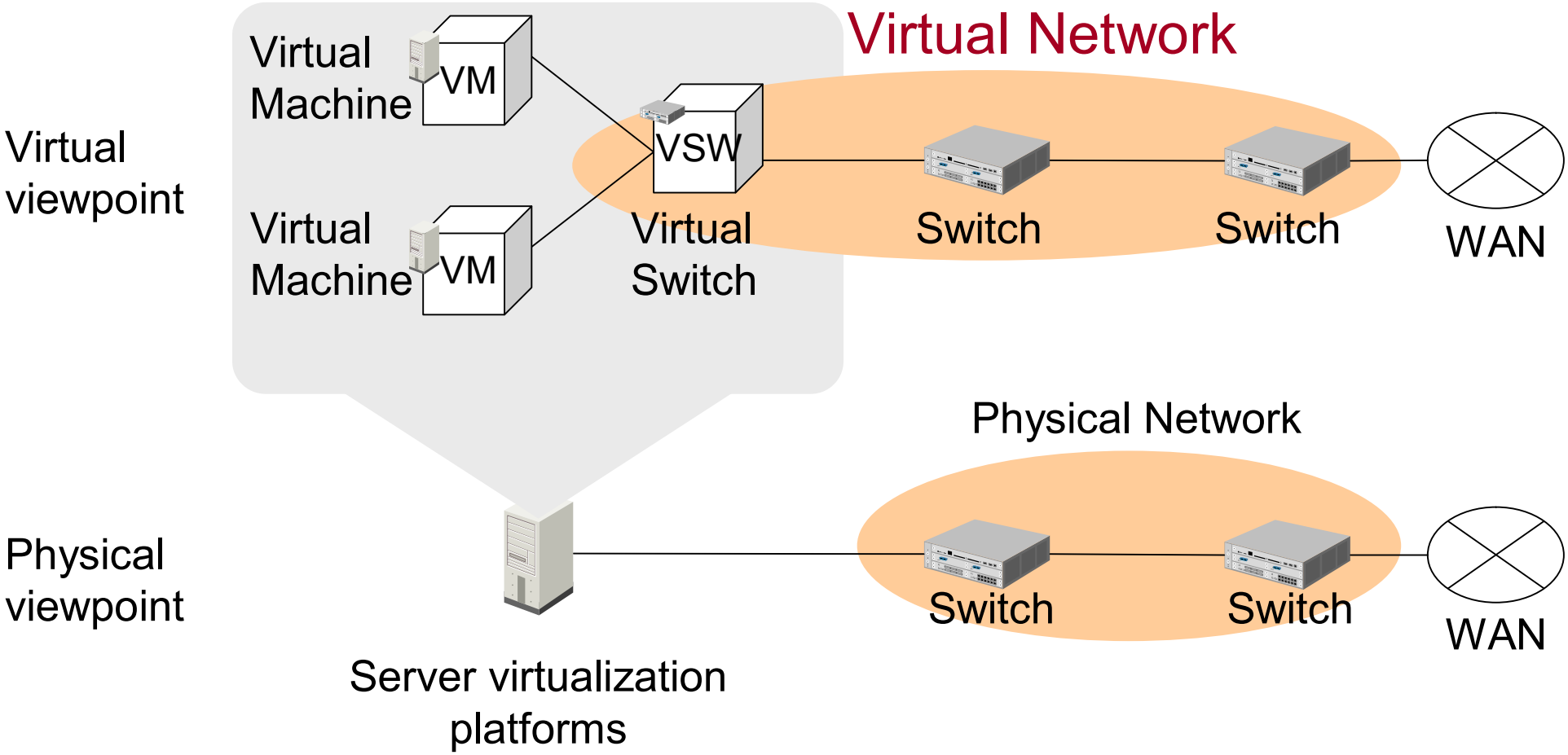
1-3 Background: Server Virtualization

- A server virtualization platform creates virtual machines and virtual switches on it.
- The virtual switch works as a virtual network element as well as a network switch.



1-4 Background: Virtual Network

- The virtual network in a data center consists of virtual switches in addition to (physical) switches.



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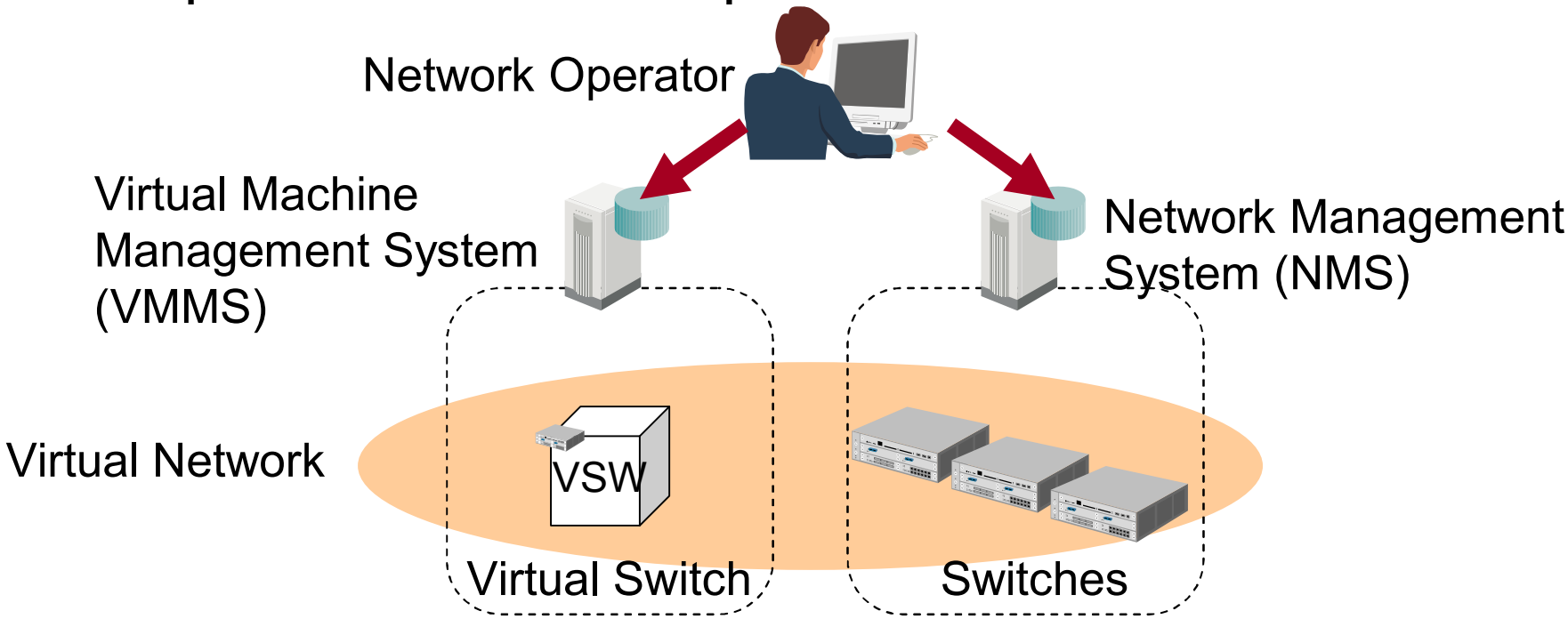
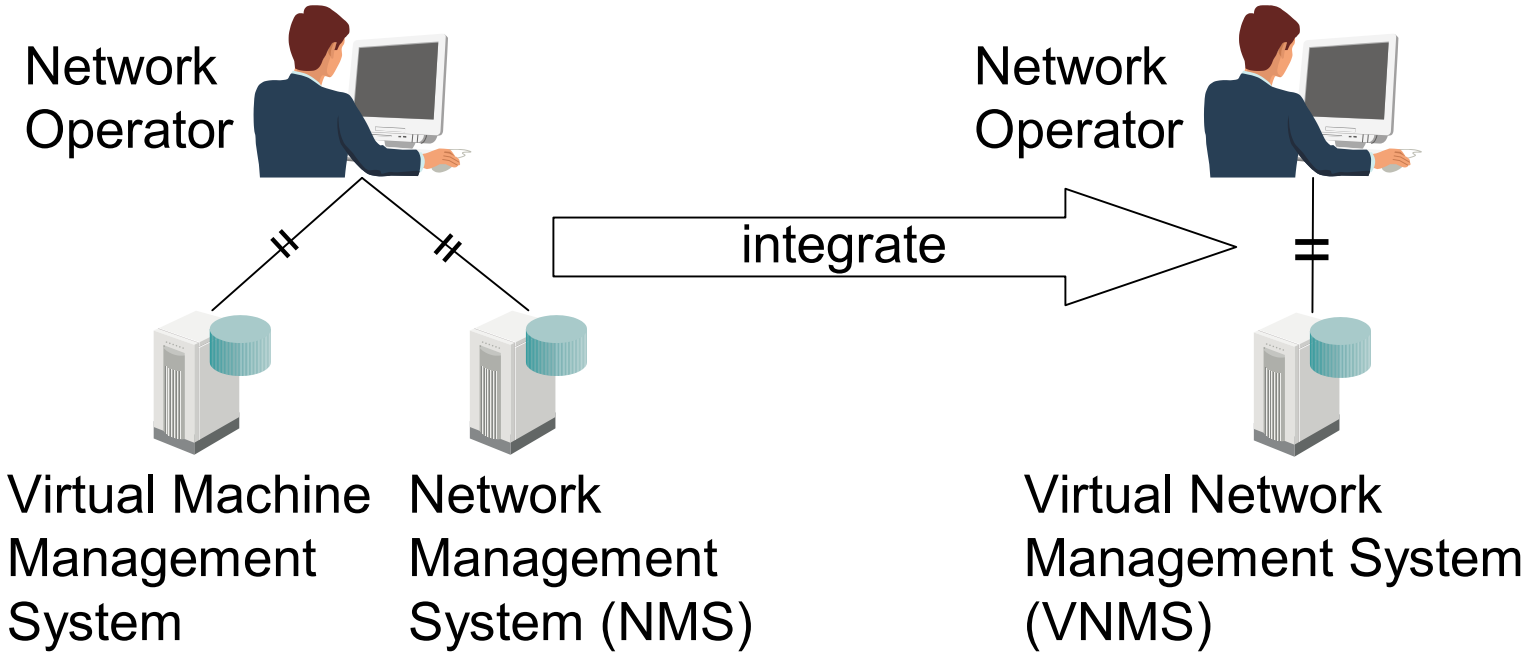
2-1 Problem

- Network operators have to use different management systems to manage virtual switches and network switches.
- As a result, management of virtual networks increases the operation time and operational costs.



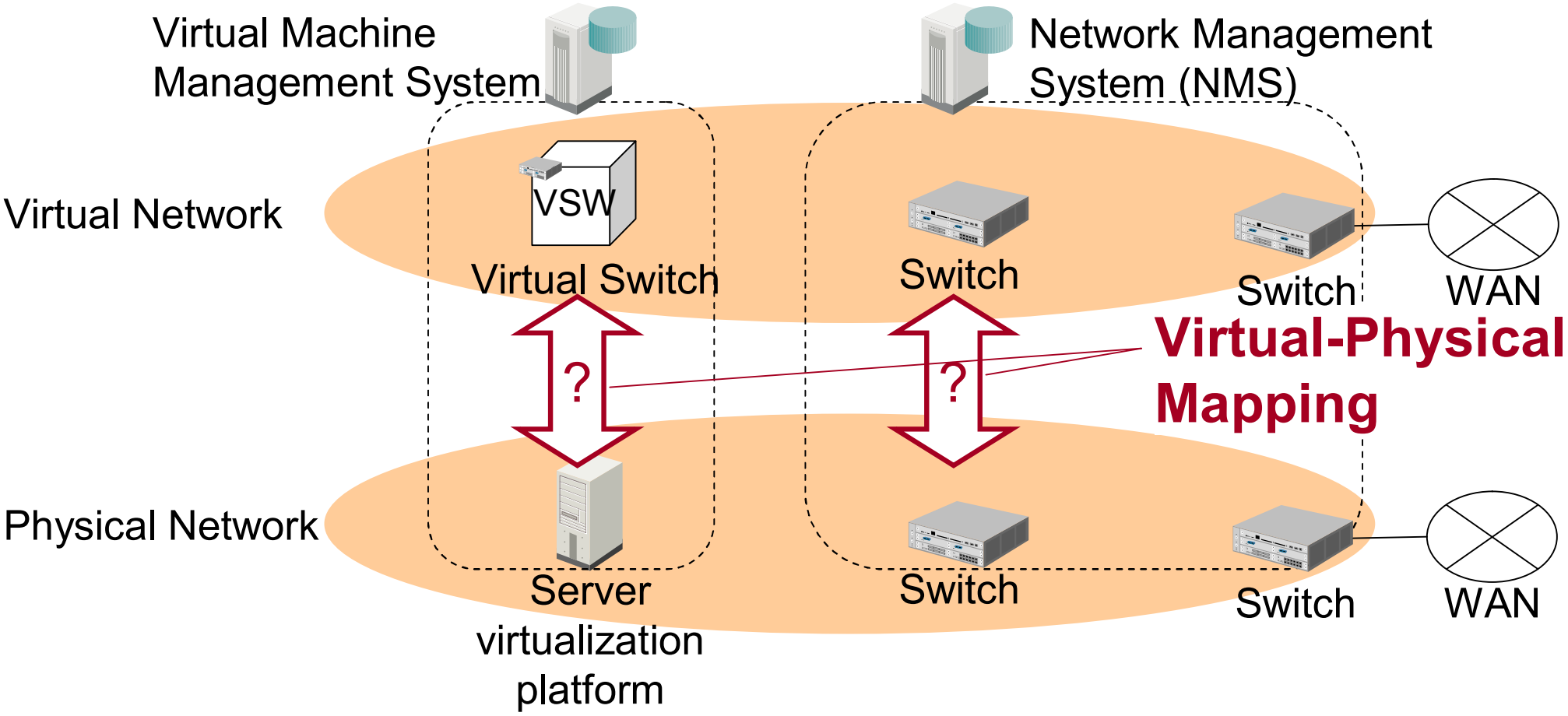
2-2 System Requirements

- To reduce the operation time, the data center network should provide an integrated management system.
- The system should enable network operators to know
  1. **Virtual-physical mapping information**
  2. **Connection information**



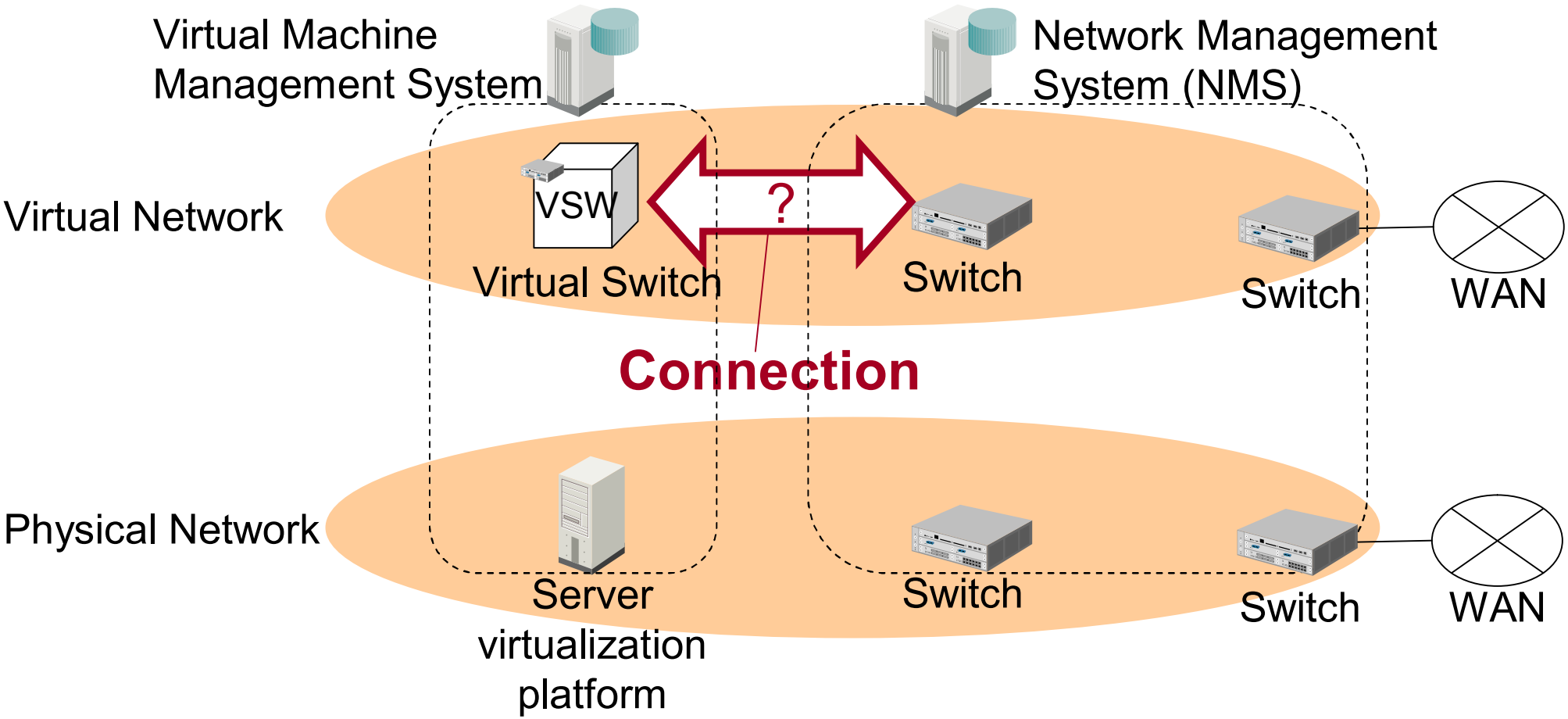
2-3 Requirement(1): Virtual-Physical Mapping Information

- Network operators need to know the mapping between a component in a virtual network and a component in a physical network.



2-4 Requirement(2): Connection Information

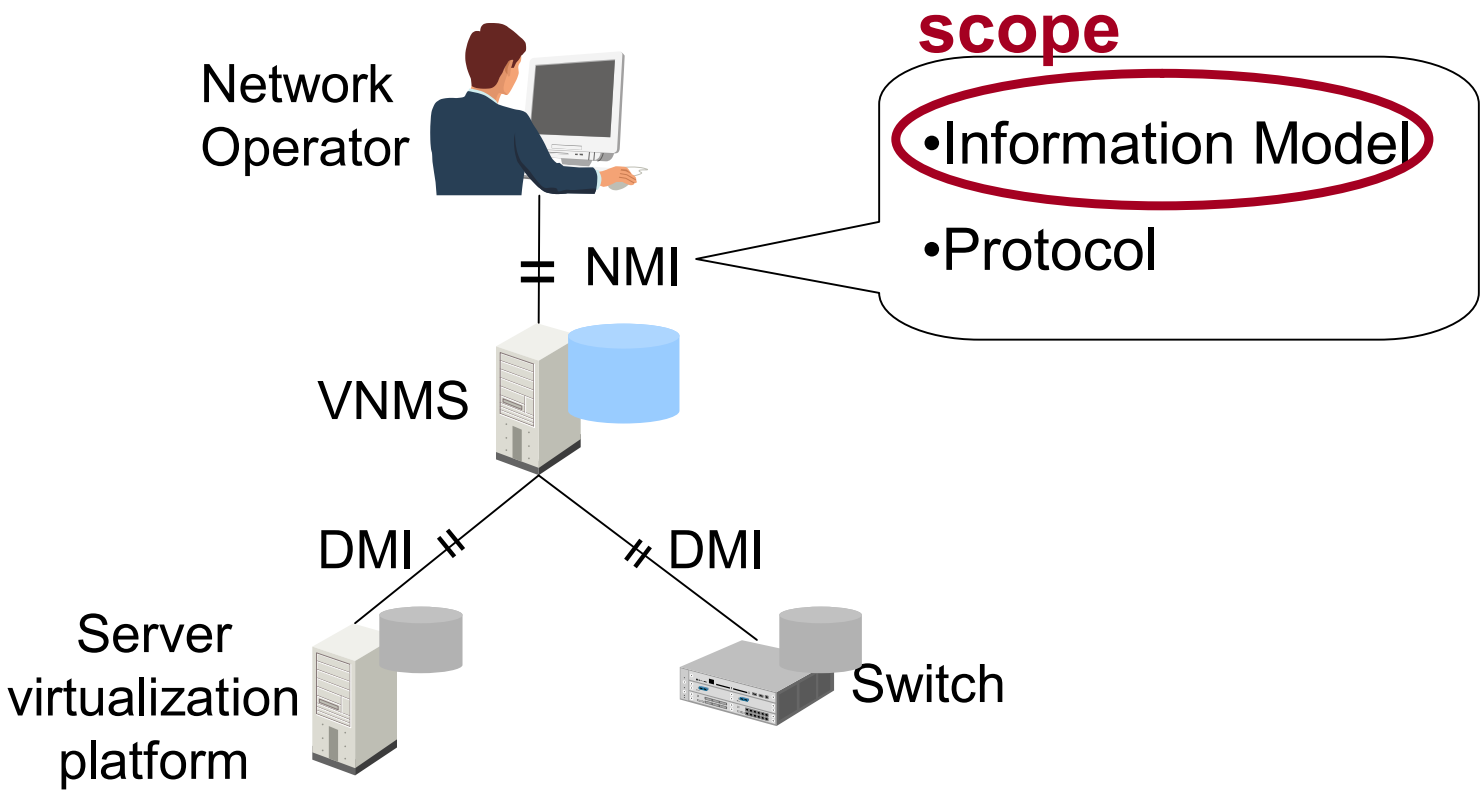
- Network operators need to know the connection among switches in a virtual network.



2-5 Scope of Proposal

- NMI (Network Management Interface)
  - Information model (in the scope)
  - Protocol to transfer management information
- DMI (Device Management Interface)

} Out of scope



2-6 Information Model Requirements

- Information model requirements arise from the system requirements.

System Requirements	Information Model Requirements
(1)Virtual-Physical Mapping Information	Mapping between virtual components and physical components.
(2)Connection Information	Connection among switches in a virtual network.

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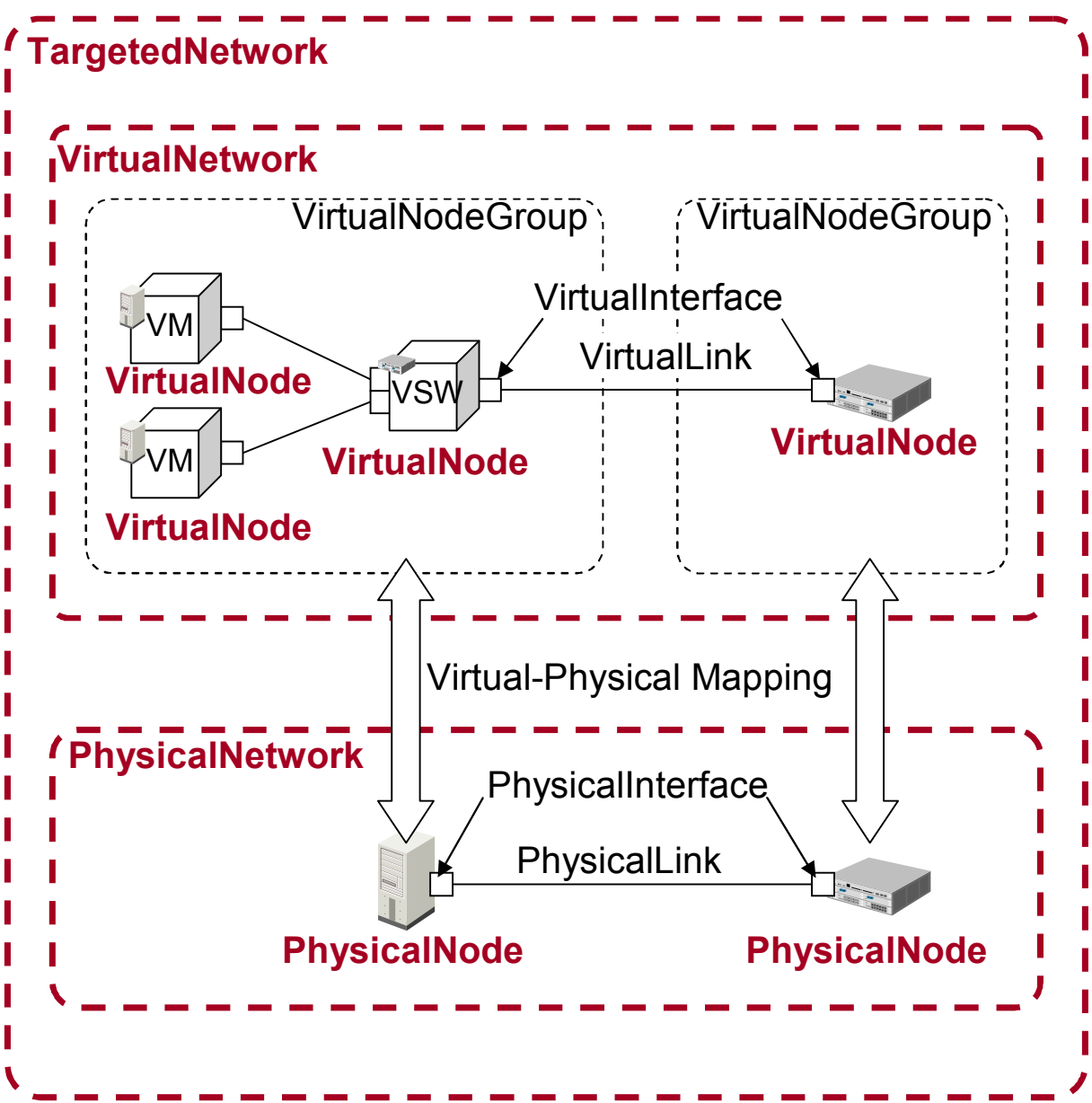
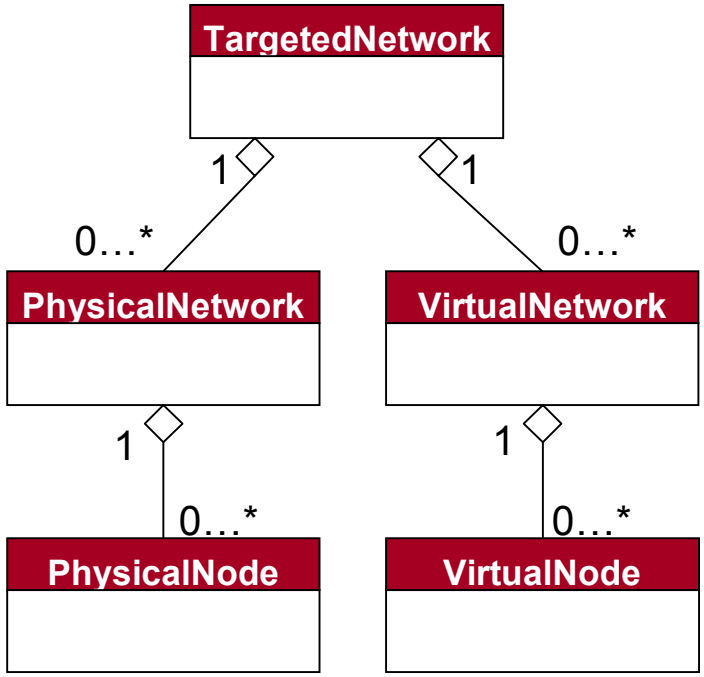
3-1 Proposal of Information Model

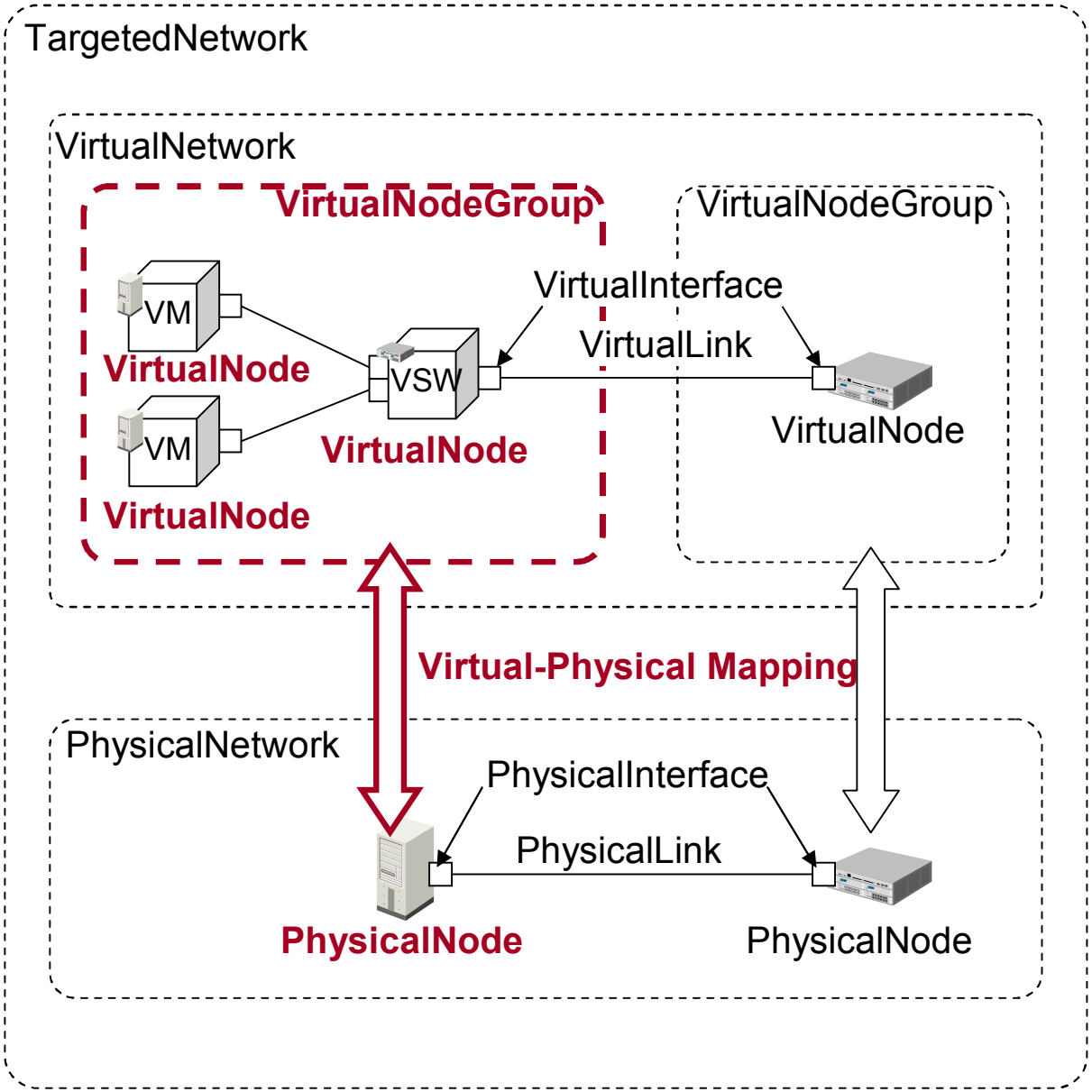
- “Virtual network management information model”
- Abstract information model
  - Object-oriented model defined by UML diagrams
  - Independent from encoding schemes and protocols
- Target
  - Data center networks containing virtual switches
- Required information
  - Requirement(1): Virtual-physical mapping information
  - Requirement(2): Connection information

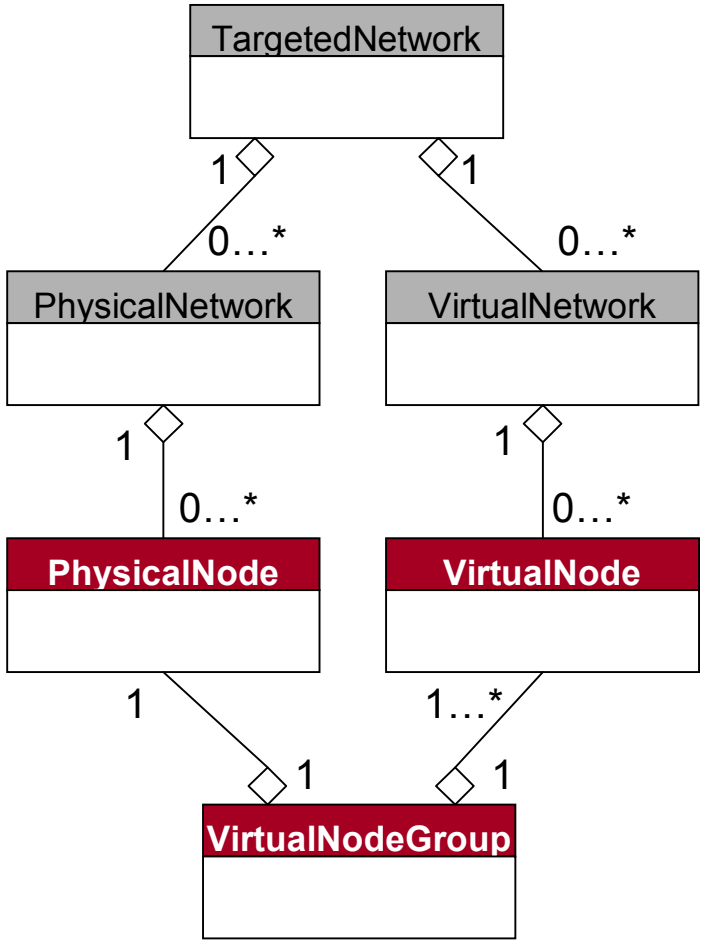
3-2 Model Overview



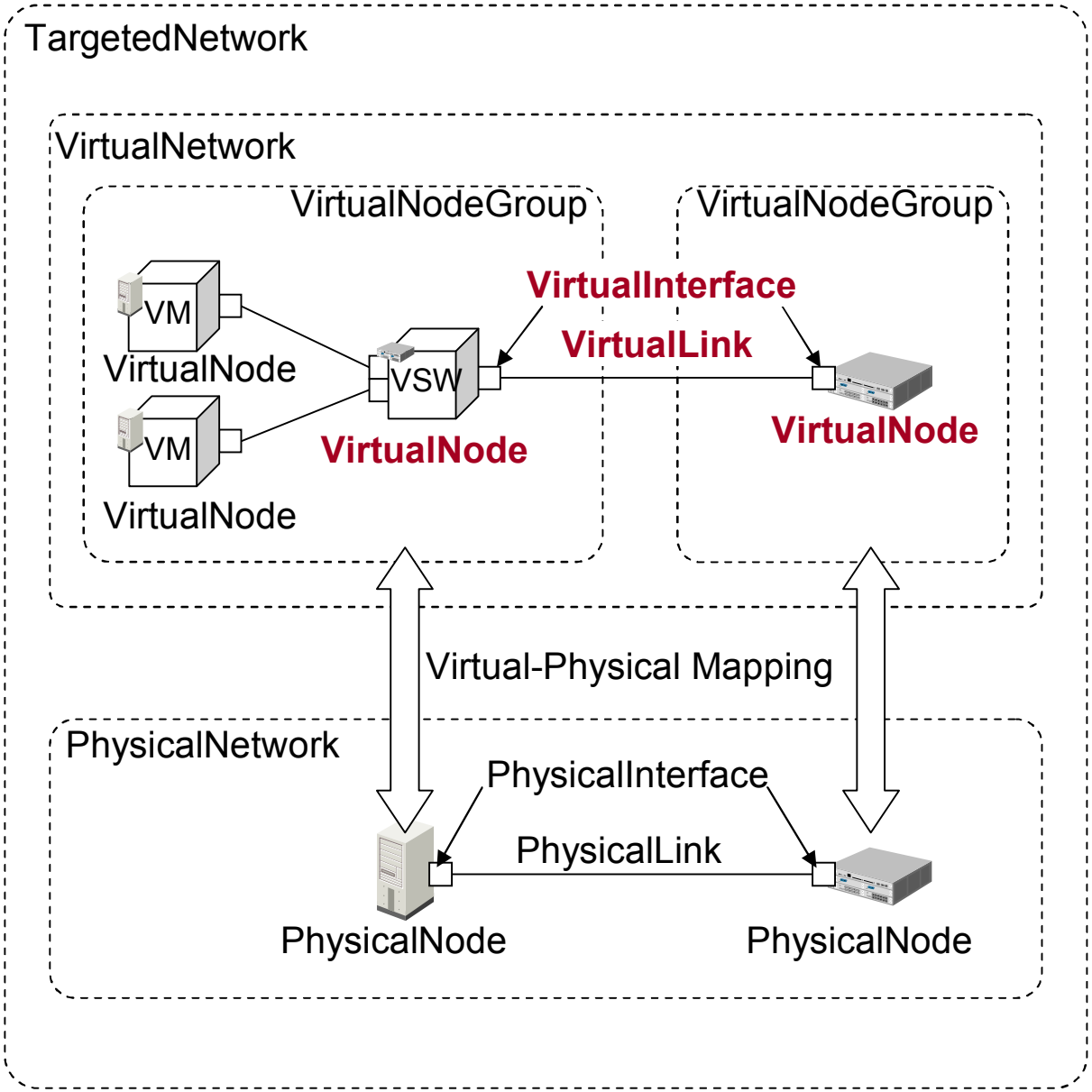


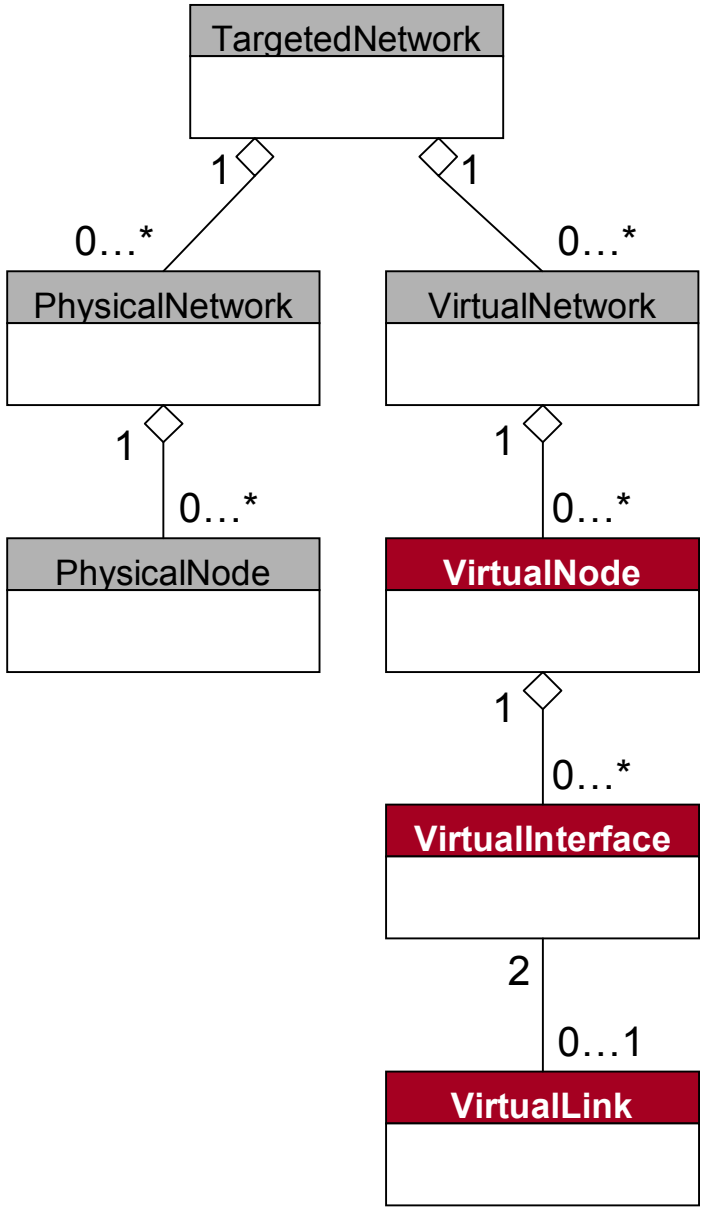
3-3 (1)Virtual-Physical Mapping Information





3-4 (2)Connection Information





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4-1 Preliminary Experiment

- Method
  - We developed a prototype of VNMS which implemented the proposed information model.
  - Operators made a VLAN configuration to connect between a VM and an existing VLAN
    - (A) By hand.
    - (B) With the prototype VNMS which stored the information about example networks.
- Environment
  - Example1 (small)
    - 8 virtual machines (4 server blades)
    - 3 physical switches
  - Example2 (large)
    - 26 virtual machines (14 server blades)
    - 8 physical switches

4-2 Result: Configuration Time

Ex. (VMs)	Test User	(A) By hand	(B) With VNMS prototype
Ex.1 (8 VMs)	1	13m03s (redundant-process mistake)	7m31s (no mistake)
	2	17m36s (no mistake)	11m16s (no mistake)
Ex.2 (26 VMs)	1	21m18s (redundant-process mistake)	21m10s (no mistake)
	2	14m34s (insufficient-process mistake)	21m19s (no mistake)

- This result shows that the proposed information model is partly effective
  - to reduce operation time.
  - to reduce operation mistakes.

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5 Summary and Next Step

- Summary
  - In data centers, virtual switches increase operation time for network management.
  - We proposed a management information model which represents
    1. Mapping between virtual switches in a virtual network and a server virtualization platform in a physical network.
    2. Connection among switches in a virtual network.
  - Our experimental result shows that the proposed model is effective in reducing the operation time or operation mistake of data center networks.
- Next Step
  - OPS area WG (opsawg) document?